slopes of the valley on either side from the water-line upwards. Their submergence is evidently, therefore, a matter of quite recent date, even historically speaking.

From the above facts and traditions I reconstructed the history of the formation of the cascades, the damming and backing up of the stream above, and the consequent submergence and killing of the trees which grew immediately along its bank, as follows: —

At the time when the general cutting of the Columbia valley had reached about the level of the present flood-plain at the Cascades, through some crack or other natural opening its waters found a passage into the underlying conglomerate bed, which, being permeable, allowed a passage of this water down stream to a point in the bed itself where it outcropped at or above the level of the lower part of the stream. Such a passage, once established, would be rapidly enlarged by the force of such an overlying mass of water as the Columbia River; and to those familiar with the corrading force of water, as shown in the stream-action of western rivers, it must readily be apparent that it would soon become large enough to take in the whole stream; that thus for a certain distance the whole Columbia would run underground, like the so-called 'Lost Rivers,' which are still found under the basalt flows of the Snake River plains. Thus would have been formed the natural bridge spoken of by the Indians. Moreover, by this lowering of its bed at this point, the bed of the river above would have been correspondingly lowered, and tree-growth would have gradually extended down to the water's edge, as it does at present.

Meantime the corrasion of this underground stream would gradually wear away the supports of the overhanging sheet of basalt, until at length they became inadequate to hold it up; and when they fell, the underground passage would have been suddenly filled, the river dammed up to the present level, and the stream also backed up so as to cover the roots of and thereby kill the trees along the lower part of its banks. Such is essentially the present condition of the stream: for the broken masses of the basalt which form the present stream-bed at the Cascades resist the wearing-away of the water better than did the conglomerate, and the river above the Cascades still stands at a higher level than it did before the falling-in of the basalt bridge.

I must admit the possibility that an actual survey of the region about the Cascades might disclose facts that would make the above explanation inadmissible, since it is founded on a very hasty and superficial examination. In spite of the fact of Captain Dutton's later and possibly more thorough examination than my own (for I have not been there since 1870), I am not quite willing to yield my theory in favor of his, for the reason that his theory involves what seems to me a geological improbability, — one which, in my experience at least, has not been supported by any observed facts. This is, that an earth movement — for such the flat anticlinal arch he assumes to account for the raising of the old flood-plain below the Cascades involves — could have proceeded more rapidly than the corrasion of as large a stream as the Columbia, so as to actually dam it up, and then have conveniently stopped, so as to allow corrasion to gain its former ascendency over the earth-movement.

S. F. EMMONS.

Washington, Feb. 8.

A carnivorous antelope.

A few months ago, while visiting a friend on a cattle-ranch in the San Andreas Mountains of southern New Mexica, I saw what to me seemed a most abnormal habit. My friend had a young antelope six or seven months old, which he had captured when very young, and kept as a pet about the ranch. This animal is, by the way, very tame, following its master about without once offering to join its fellows, which often come in sight of the house. When offered pieces of raw beef, it will eat the meat with evident relish, and in preference to vegetable food. I have seen it eat piece after piece until it has disposed of half a pound or more, then it would walk to the corn-crib and eat corn as a sort of dessert. It also eats bread, cooked potato, and sweet-potato both raw and cooked.

RALPH S. TARR.

Cambridge, Feb. 14.

Language-teaching.

The important subject of the teaching of modern languages having been discussed in the columns of *Science*, and no definite plans having been offered by either of the writers discussing it, perhaps the original and independent views of a practical teacher will not be unwelcome.

It is obvious that a complete knowledge of a language consists, 1°, in having full command over the bodily organs through which it is either received or communicated to others, — viz, the vocal organs, ears, and eyes, — so as to be able to utter any sound like a native, to understand all that he says, and to read any book aloud in the proper manner; 2°, in mastering those fundamental rules of grammar — including those of the verbs — indispensable in order to speak and write correctly; 3°, in the possession of a fund of words and idiomatic forms for the expression of ideas; and, 4°, in the power of using these words and forms according to the special genius of the language studied.

Sounds of the human voice are the vibrations of an expired current of air, produced by the vocal organs, which (in the case of the French pronunciation) are, for the formation of every sound, in a fixed and determined position. In my book on pronunciation, 'French orthoepy,' I have indicated the relative positions of the vocal muscles for every French articulation and vowel. The learner is trained, by means of different vocal exercises, to use the instrument of speech in exactly the same manner as the natives; and, employing the same means, he must necessarily obtain the same result. These gymnastics of the voice are accomplished in a few short hours, and are an indispensable preliminary exercise before commencing the study proper of the language.

Teaching a language without the few fundamental rules that regulate it, including those of the verbs, is depriving the student of a most valuable aid and guide; while making grammar the all-important subject, especially in the beginning, is to create a confusion in his mind, and to impede his progress. I have taken a middle course; and in my grammar will be found, in a concise form, only those general rules without which nobody can either speak or write properly. My grammatical exercises have been framed with the view of initiating the learner into the idioms and construction of the language. To avoid those disconnected and commonplace phrases